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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,090	04/14/2004	Wen-Yen Lin	251702-1370	7018

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EXAMINER	
CHANDRAN, BIJU INDIRA	

ART UNIT	PAPER NUMBER
2835	

DATE MAILED: 12/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/824,090	LIN ET AL.	
	Examiner	Art Unit	
	Biju Chandran	2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-9, 12, 13, 15-24, 27, 28, and 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (US 5,218,516) in view of Frutschy et al. (US 2003/0062602 A1).

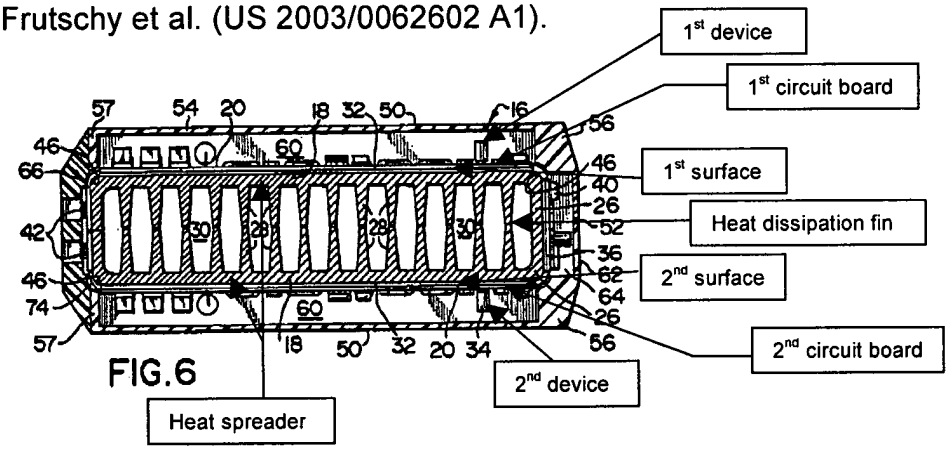

FIG.6

- With respect to claim 1, Collins et al. disclose a function module comprising: a first circuit board including a first surface; a second circuit board, coupled to the first circuit board, including a second surface facing the first surface; and a heat dissipation fin, disposed between the first circuit board and the second circuit board. While Collins et al. does provide the capability for grounding the circuit boards and the heat dissipation fin (column 8, lines 5-20), they do not explicitly disclose a first ground layer on the first surface and a second

ground layer on the second surface. Frutschy et al. disclose a circuit board with an exposed ground layer on the surface ('720' and '710' in figure 7) abutting the heat dissipation member ('530' in figure 5). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the exposed ground layer on the surface abutting the heat dissipation member as taught by Frutschy et al. in the function module disclosed by Collins et al. to provide a path for increased power delivery for the module (Frutschy et al. paragraph 0001), along with EMI shielding capability (Collins et al. Column 8, lines 20-23).

- With respect to claim 2, Collins et al. further disclose that the first circuit board further includes a third surface, opposite to the first surface, with a first device located thereon (marked in figure).
- With respect to claim 3, Collins et al. further disclose that the second circuit board further includes a fourth surface, opposite to the second surface, with a second device located thereon (marked in figure).
- With respect to claim 4, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 1. Frutschy et al. further discloses that the ground layer is made of copper (paragraph 0034).
- With respect to claim 5, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 1. Frutschy does not explicitly disclose the thickness of the ground layer. If the thickness of the

exposed ground layer disclosed by Frutschy et al. is not already substantially not less than 1.5 mils, it would have been obvious to one of ordinary skill in the art to make it substantially not less than 1.5 mils, or any other thickness based upon routine experimentation, to be able to supply the requisite amount of power and satisy other performance goals like the ability to withstand repeated assembly and disassembly, while meeting cost and manufacturability goals.

- With respect to claim 6, Collins et al. further disclose a flat cable (44) connecting the first circuit board and the second circuit board, providing communicability there between (column 7, lines 1-5).
- With respect to claim 7, Collins et al. further disclose a connector (42) connecting the first circuit board and the second circuit board, providing communicability there between (column 6, lines 65 – column 7, line 5).
- With respect to claim 8, Collins et al. further disclose that the connector is a slot connector (47; column 3, lines 25-30).
- With respect to claim 9, Collins et al. further disclose a first heat spreader (18), disposed between the heat dissipation fin and the first ground layer, for uniformly spreading the heat over the first circuit board; and a second heat spreader (18), disposed between the heat dissipation fin and the second ground layer, for uniformly spreading the heat over the second circuit board (also marked in the attached figure).

- With respect to claim 12, Colliers et al. further disclose a first adhesion layer, disposed between the heat dissipation fin and the first ground layer, for combining the heat dissipation fin with the first circuit board; and a second adhesion layer, disposed between the heat dissipation fin and the second ground layer, for combining the heat dissipation fin with the second circuit board (column 4, lines 13-16).
- With respect to claim 13, Colliers et al. further disclose that both the first adhesion layer and the second adhesion layer comprise one selected from the group consisting of brazing solder, tin solder, thermal interface material, grease and the combination thereof respectively (column 4, lines 13-16).
- With respect to claim 15, Collins et al. disclose a function module comprising: a first circuit board including a first surface; a second circuit board, coupled to the first circuit board, including a second surface facing the first surface; and a heat dissipation fin, disposed between the first circuit board and the second circuit board. While Collins et al. does provide the capability for grounding the circuit boards and the heat dissipation fin (column 8, lines 5-20), they do not explicitly disclose a first heat conduction layer on the first surface and a second heat conduction layer on the second surface. Frutschy et al. disclose a circuit board with an exposed heat conduction layer on the surface ('720' and '710' in figure 7) abutting the heat dissipation

member ('530' in figure 5). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the exposed ground layer on the surface abutting the heat dissipation member as taught by Frutschy et al. in the function module disclosed by Collins et al. to provide increased heat spreading and a path for increased power delivery for the module (Frutschy et al. paragraph 0001), along with EMI shielding capability (Collins et al. Column 8, lines 20-23).

- With respect to claim 16, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 15. Frutschy et al. further disclose that the first heat conduction layer is a ground layer of the first circuit board, and the second heat conduction layer is a ground layer of the second circuit board (paragraph 0040).
- With respect to claim 17, Collins et al. further disclose that the first circuit board further includes a third surface, opposite to the first surface, with a first device located thereon (marked in figure).
- With respect to claim 18, Collins et al. further disclose that the second circuit board further includes a fourth surface, opposite to the second surface, with a second device located thereon (marked in figure).
- With respect to claim 19, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 1. Frutschy et al. further discloses that the heat conduction layer is made of copper (paragraph 0034).

- With respect to claim 20, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 15. Frutschy does not explicitly disclose the thickness of the heat conduction layer. If the thickness of the exposed heat conduction layer disclosed by Frutschy et al. is not already substantially not less than 1.5 mils, it would have been obvious to one of ordinary skill in the art to make it substantially not less than 1.5 mils, or any other thickness based upon routine experimentation, to efficiently spread the heat, to supply the requisite amount of power and satisfy other performance goals like the ability to withstand repeated assembly and disassembly, while meeting cost and manufacturability goals.
- With respect to claim 21, Collins et al. further disclose a flat cable (44) connecting the first circuit board and the second circuit board, providing communicability there between (column 7, lines 1-5).
- With respect to claim 22, Collins et al. further disclose a connector (42) connecting the first circuit board and the second circuit board, providing communicability there between (column 6, lines 65 – column 7, line 5).
- With respect to claim 23, Collins et al. further disclose that the connector is a slot connector (47; column 3, lines 25-30).
- With respect to claim 24, Collins et al. further disclose a first heat spreader (18), disposed between the heat dissipation fin and the first

heat conduction layer, for uniformly spreading the heat over the first circuit board; and a second heat spreader (18), disposed between the heat dissipation fin and the second heat conduction layer, for uniformly spreading the heat over the second circuit board (also marked in the attached figure).

- With respect to claim 27, Colliers et al. further disclose a first adhesion layer, disposed between the heat dissipation fin and the first ground layer, for combining the heat dissipation fin with the first circuit board; and a second adhesion layer, disposed between the heat dissipation fin and the second ground layer, for combining the heat dissipation fin with the second circuit board (column 4, lines 13-16).
- With respect to claim 28, Colliers et al. further disclose that both the first adhesion layer and the second adhesion layer comprise one selected from the group consisting of brazing solder, tin solder, thermal interface material, grease and the combination thereof respectively (column 4, lines 13-16).
- With respect to claim 30, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 15. Frutschy et al. further disclose that the heat conduction layer is a power source surface of the circuit board (paragraph 0040).

2. Claims 10, 11, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. in view of Frutschy et al., and further in view of Richardson et al. (US 2003/0067757 A1).

- Regarding claim 10, Collins et al. as modified by Frutschy et al. satisfies all the limitations of claim 9. Colliers et al. further discloses that the first and second heat spreader is made of metal, but does not explicitly disclose the type of metal. Richardson et al. discloses a heat spreader with fins (110) made of a conductive material like copper (paragraph 0020 – end). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the copper heat spreader as taught by Richardson et al. to increase the heat spreading capability of the spreader.
- Regarding claim 11, Collins et al. as modified by Frutschy et al. satisfies all the limitations of claim 9. Colliers et al. further discloses that the first and second heat spreader is made of metal, but does not explicitly disclose the type of metal. Richardson et al. discloses a heat spreader with fins (110) made of a conductive material like copper (paragraph 0020 – end). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the copper heat spreader as taught by Richardson et al. to increase the heat spreading capability of the spreader. Copper has a thermal conductivity greater than 100W/m K. (ASM handbook, Volume 2,

Properties and Selection: Nonferrous Alloys and Special-Purpose Materials, Properties of Pure metals, See Figure 10, and Table 13).

- Regarding claim 25, Collins et al. as modified by Frutschy et al. satisfies all the limitations of claim 24. Colliers et al. further discloses that the first and second heat spreader is made of metal, but does not explicitly disclose the type of metal. Richardson et al. discloses a heat spreader with fins (110) made of a conductive material like copper (paragraph 0020 – end). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the copper heat spreader as taught by Richardson et al. to increase the heat spreading capability of the spreader.
- Regarding claim 26, Collins et al. as modified by Frutschy et al. satisfies all the limitations of claim 15. Colliers et al. further discloses that the first and second heat spreader is made of metal, but does not explicitly disclose the type of metal. Richardson et al. discloses a heat spreader with fins (110) made of a conductive material like copper (paragraph 0020 – end). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the copper heat spreader as taught by Richardson et al. to increase the heat spreading capability of the spreader. Copper has a thermal conductivity greater than 100W/m K. (ASM handbook, Volume 2,

Properties and Selection: Nonferrous Alloys and Special-Purpose Materials, Properties of Pure metals, See Figure 10, and Table 13).

3. Claims 14 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. in view of Frutschy et al., and further in view of Lin et al. (US 6,501,651 B2).

- Regarding claim 14, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 1. Collins et al. further discloses a fan to dissipate the heat from the heat dissipation fin. However, Collins et al. do not explicitly disclose that the fan is connected to the heat dissipation fin. Lin et al. discloses a heat dissipation means (30) with a fan (40) attached to the heat dissipation fins (38). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the fan attached to the fins as taught by Lin et al. in the function module disclosed by Collins et al. to dissipate heat more effectively from the fins.
- Regarding claim 29, Collins et al. as modified by Frutschy et al. meets all the limitations of claim 15. Collins et al. further discloses a fan to dissipate the heat from the heat dissipation fin. However, Collins et al. do not explicitly disclose that the fan is connected to the heat dissipation fin. Lin et al. discloses a heat dissipation means (30) with a fan (40) attached to the heat dissipation fins (38). At the time of the

invention, it would have been obvious to one of ordinary skill in the art to incorporate the fan attached to the fins as taught by Lin et al. in the function module disclosed by Collins et al. to dissipate heat more effectively from the fins.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Biju Chandran whose telephone number is (571) 272-5953. The examiner can normally be reached on 8AM - 5PM. Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynn Feild can be reached on (571) 272-2092. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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